



UNITED STATES PATENT AND TRADEMARK OFFICE

1/b

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
08/916,629	08/22/1997	CHAD A. COBBLEY	97-0098	3496

7590 07/26/2004

STEPHEN A GRATTON
2764 SOUTH BRAUN WAY
LAKEWOOD, CO 80228

EXAMINER

AFTERGUT, JEFF H

ART UNIT	PAPER NUMBER
----------	--------------

1733

DATE MAILED: 07/26/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

08/916,629

Applicant(s)

COBBLEY ET AL.

Examiner

Jeff H. Aftergut

Art Unit

1733

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 June 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22 and 40-44 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-22 and 40-44 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

Claim Rejections - 35 USC § 103

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
2. Claims 1-20 and 42-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Krall in view of Chorbadjiev et al, the admitted prior art, either one of Loctite 410 or Loctite 416 optionally further taken with the state of the prior art as exemplified by at least one of Liang et al, Fogal et al, Farnworth, Davis, and German Patent 4107347.

Krall taught that it was known at the time the invention was made in the art of manufacturing electronic microchips to utilize methyl cyanoacrylate or other cyanoacrylates as an adhesive for joining contact leads to chips. Since the major failure mode of chips occurs at the chip lead interface, it would have been advantageous if such cyanoacrylate adhesives were radiopaque so that the weld could be examined, see column 1, lines 42-53. Clearly, it was known at the time the invention was made to utilize a cyanoacrylate adhesive to join the contact leads of a leadframe to a chip. The reference failed to make mention of the speed with which the cyanoacrylate adhesive cured in the operation. The reference additionally failed to teach that one skilled in the art at the time the invention was made would have employed a die attach mechanism to assemble the die to the leadframe wherein the same included aligning mechanisms to ensure proper alignment of the chip to the leadframe as well as a vacuum tool for manipulating the die and a dispensing means for application of the adhesive upon the leadframe or die. It should be noted that some means must have been provided for in the manufacture of a die on leadframe assembly, however the reference to Krall is silent as to the nature of the same.

Art Unit: 1733

In the art of manufacturing electronic components (such as the attachment of a chip to leads), the reference to Chorbadjiev et al (the article entitled "The effect of fillers upon properties of electroconductive cyanoacrylate adhesives" from the International Journal of Adhesion and Adhesives, July 1988) suggested that cyanoacrylate adhesives when compared to traditional epoxy adhesives had the following strong points: (1) short setting time at room temperature; (2) one component adhesives; (3) strong bonding action; (4) easy to work with, and; (5) satisfactory electroconductivity of adhesive bonds. It should be noted that the reference to Chorbadjiev et al is concerned with the manufacture of an electroconductive adhesive material (which is was one would have utilized to join the chip to the leads in Krall. The reference clearly suggested that the curing times would have been short with cyanoacrylate and additionally provided additional reasoning as to why those skilled in the art at the time the invention was made would have selected cyanoacrylate adhesives for the bonding of the chip to the lead of the leadframe. The reference, nonetheless, did not expressly state that the material would have cured in less than one minute at room temperature (20-30 degrees C) to between 90-100% crosslink density (polymerization). Additionally, the reference is silent as to the systems employed to attach the die to the leadframe (whether employing cyanoacrylate adhesive or epoxies).

However, the applicant has repeatedly admitted that the cure times are intrinsically a property of cyanoacrylate adhesives (see page 11, of the response dated 9-12-2001 in child patented file Serial Number 09/274,128, for example):

"In this regard, Applicant would submit that although cyanoacrylate adhesives and anaerobic adhesives, which are formulated to cure in less than sixty seconds, are known in the art, they have not heretofore been used to construct a semiconductor package as presently claimed."

Art Unit: 1733

Clearly, the quick curing of the adhesive was known per se in the art. Additionally, those skilled in the art at the time the invention was made would have understood that the die attachment operation would have been performed in a manufacturing environment for high speed productivity wherein such processing would have included the use of the conventional die attachment systems known in the art. Such systems as described by applicant in the specification (admitted as known by applicant) included the use of a leadframe having several paddles for attaching each die to the leadframe (page 2, lines 10-22), a leadframe feed mechanism for manipulating the leadframes, a vacuum tool for manipulating the dice, a dispensing mechanism for applying a desired volume of adhesive to the mounting paddles, an optical alignment device for aligning the dice to the mounting paddles, and a die support platform for placing the dice in contact with the mounting paddles with a required pressure (see page 9, line 22-page 10, line 2 of the specification). Clearly, applicant has admitted that the system for attaching the die to the leadframe was known per se in the art and included the use of the dispenser for depositing the adhesive, an alignment apparatus for properly aligning the die to the leadframe, a vacuum tool for manipulating the die and a pressing mechanism to press the die to the paddle of the leadframe. One would have been motivated to employ a cyanoacrylate adhesive in the operation (the device) for the reasons identified by Krall and Chorbadjiev et al.

As evidenced by Loctite 410 and Loctite 416, commercially available quick curing cyanoacrylate adhesives existed which cured within 60 seconds at room temperature to complete cure (100% polymerization). The applicant is referred to the spec sheets of Loctite 410 and Loctite 416 for the specific curing properties achieved with the use of the same. It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize a

Art Unit: 1733

cyanoacrylate adhesive to join leads of a leadframe to a semiconductor chip as such was suggested by Krall wherein the cyanoacrylate adhesive would have been known to have incorporated an electrically conductive filler therein in order to facilitate electrical conductivity whereby such an adhesive had a quick cure time as evidenced by Chorbadjiev et al and wherein the adhesive was known to have had a cure time within less than one minute at room temperature as suggested by the applicant's admitted prior art and either one of Loctite 410 or Loctite 416 wherein the processing for attach the die to the leadframe utilized commercially available and conventional components for facilitating the automated placement of the die to the leadframe as admitted were known by applicant's admitted prior art..

With regard to the various dependent claims, the applicant is advised that the admitted prior art suggested that chip on lead assembly was known per se as well as wire bonding and encapsulating the same. the applicant's disclosed contribution (and the application has been argued as such) to the art was the recognition that cyanoacrylate adhesives would have been useful for joining leads to a chip in the semiconductor art and that no reference suggested the same. The reference to Krall suggested the use of cyanoacrylate adhesives to join a chip to leads of a leadframe. The particular configuration of the semiconductor assembly would have been selected dependent upon the desired demands of the customer and are within the skill level of the ordinary artisan to select (the various chip arrangements and lead arrangements are taken as conventional in the art). The applicant is additionally advised that one skilled in the art would have known to incorporate a filler such as an electrically conductive filler in the resin as suggested by Chorbadjiev et al.

Art Unit: 1733

Krall suggested that cyanoacrylate adhesive would have been useful for joining a chip to a lead in the manufacture of a semiconductor package. The reference did not expressly state that the chip was assembled to the leadframe but rather referred to the chip being attached to the leads with adhesive. It should be noted that the reference clearly did not refer to "wire bonding" as addressed by applicant in the response. The reference was silent as to what was meant by chip to lead attachment. The applicant is advised that one skilled in the art would have been expected to have basic knowledge of the art and one skilled in the art would have been expected to use common sense and common knowledge from the art, In re Bozek, 163 USPQ 545. The ordinary artisan is presumed to know more than what he reads in the references, he is presumed to have sufficient basic knowledge to apply and combine features of the prior art, In re Sovish, 226 USPQ 771, In re Bode, 191 USPQ 12.

The references to any one of Liang et al, Fogal et al, Farnworth, Davis, and German Patent 4107347 all suggested that one skilled in the art would have known that "wire bonding" was associating a wire between the chip and the leads and that the wire bonding operation did not include the use of adhesive to join the wire to the chip and the lead. Applicant is referred to the drawings of each document. Additionally, each reference suggested that one skilled in the art would have incorporated an adhesive like an epoxy between the chip and/or die and the leadframe at the paddle of the leadframe. In each of these references, this is where the chip and the lead frame interface is taught and where the same is joined with adhesive. The applicant is also referred to the admitted prior art of this application, where the applicant admitted that it was known to join a chip to a leadframe with epoxy adhesive for example, see pages 2-3 of the specification and note that the admitted prior art also suggested that "wire bonding" was in fact a

Art Unit: 1733

separate and distinct operation from the adhesive bonding operation. Clearly, one viewing the state of the prior art as exemplified by at least one of Liang et al, Fogal et al, Farnworth, Davis, and German Patent 4107347. Certainly, then, when one skilled in the art viewed Krall, one skilled in the art would have understood that the operation where adhesive was used would have included the joining of the chip to the paddle of the leadframe (since this is the place where the chip is associated with adhesive in the operation of associating a chip to a lead) with the cyanoacrylate adhesive.

3. Claims 21, 22,40 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over the admitted prior art in view of Japanese Patent 58-196,280.

The admitted prior art suggested that it was known to join a chip to a leadframe with an epoxy adhesive material, see pages 2 and 3 of the specification. Additionally, those skilled in the art at the time the invention was made would have understood that the die attachment operation would have been performed in a manufacturing environment for high speed productivity wherein such processing would have included the use of the conventional die attachment systems known in the art. Such systems as described by applicant in the specification (admitted as known by applicant) included the use of a leadframe having several paddles for attaching each die to the leadframe (page 2, lines 10-22), a leadframe feed mechanism for manipulating the leadframes, a vacuum tool for manipulating the dice, a dispensing mechanism for applying a desired volume of adhesive to the mounting paddles, an optical alignment device for aligning the dice to the mounting paddles, and a die support platform for placing the dice in contact with the mounting paddles with a required pressure (see page 9, line 22-page 10, line 2 of the specification). Clearly, applicant has admitted that the system for attaching the die to the leadframe was known

Art Unit: 1733

per se in the art and included the use of the dispenser for depositing the adhesive, an alignment apparatus for properly aligning the die to the leadframe, a vacuum tool for manipulating the die and a pressing mechanism to press the die to the paddle of the leadframe. The applicant also admitted that anaerobic and cyanoacrylate adhesives were known in the prior art and had been formulated to cure in less than 60 seconds but that the same were not known to have been used to construct a semiconductor package.

The reference to Japanese Patent '280 suggested that it was known to utilize an anaerobic adhesive to join a chip to leads of a board in the manufacture of a semiconductor assembly wherein the anaerobic adhesive material was an acrylic anaerobic adhesive material. The reference failed to make mention of the specific cure times of the anaerobic adhesive material, however it did suggest that the cure times would have been fast. Additionally, the abstract suggested that the adhesive would have included filler therein in order to render the adhesive material electrically conductive. It would have been obvious to employ the quick curing adhesives of Japanese Patent '280 in the operation of joining a chip to a leadframe as such use of anaerobic adhesives would have sped up productivity where the processing included the use of conventional die attachment operations such as those admitted by applicant's admitted prior art.

Response to Arguments

4. Applicant's arguments filed 6-15-04 have been fully considered but they are not persuasive.

The applicant has amended the various independent claims to recite that one skilled in the art at the time the invention was made would have incorporated a die attach system for attaching

Art Unit: 1733

the die to the paddle of the leadframe wherein the same included a vacuum tool for manipulating the die, an alignment means to ensure proper alignment of the die to the leadframe paddle, a means to press the die to the paddle of the leadframe as well as a means to dispense the adhesive onto the leadframe. The applicant is advised, however, that such are part of the conventional and commercially available machines utilized to attach a die to a leadframe. Such was admitted by applicant as evidenced by the admitted prior art. The question to be answer then is would one have reasonably expected that the cyanoacrylate binder or anaerobic binder been used in such conventional processes. If it was indeed obvious to employ such anaerobic or cyanoacrylate adhesives would one have reasonable expected success when used in the conventional die attachment arrangement. As the references to Krall and Chorbadjiev et al suggested that one skilled in the art would have desired to utilize a cyanoacrylate binder in the operation, one would have clearly desired to utilize the same. Additionally, one skilled in the art would have understood that the only component of the conventional machinery utilized to attach a die to a leadframe when using a cyanoacrylate binder which would have been different was the necessity for the heat curing of the adhesive (as the binder cured very quickly as discussed above). As such, one would have reasonably expected success when utilizing the desired cyanoacrylate resins to attach the die to the leadframe. It should be noted that obviousness does not require absolute predictability but rather only a reasonable expectation of success is required, In re O'Farrell, 7 USPQ2d 1673. The same can be said for the use of an anaerobic cured adhesive wherein the reference to Japanese Patent 58-196,280 suggested that such would have been useful for mounting a die to a leadframe in the manufacture of a semiconductor package. Exclusion of the heat curing mechanism in the conventional system would have been obvious to one of

Art Unit: 1733

ordinary skill in the art at the time the invention was made and one would have reasonable expected that such would have functioned well.

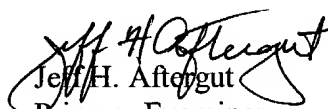
Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. German Patent 3232659 and Japanese Patent 62-57475 suggested the use of cyanoacrylate adhesives for bonding die to a leadframe. The references to Japanese Patent 63-143823, Japanese Patent 61-89652, and Japanese Patent 03-195033 all suggested the use of anaerobic adhesives to bond a die to a leadframe in semiconductor manufacture.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeff H. Aftergut whose telephone number is 571-272-1212. The examiner can normally be reached on Monday-Friday 7:15-345 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Blaine Copenheaver can be reached on 571-272-1156. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Jeff H. Aftergut
Primary Examiner
Art Unit 1733

Application/Control Number: 08/916,629
Art Unit: 1733

Page 11

JHA
July 22, 2004